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Comparing a random forest based prediction of winter wheat yield to historical production potential

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Predicting wheat yield is crucial due to the importance of wheat across the world. When modeling yield, the difference between potential and actual yield consistently changes because of technology. Considering historical yield potential would help determine spatiotemporal trends in agricultural development. Comparing current and historical production in Denmark is possible because production has been documented throughout history. However, the current winter wheat yield model is solely based on soil. The aim of this study was to generate a new Danish winter wheat yield map and compare the results to historical production potential. Utilizing random forest with soil, climate, and topography variables, a winter wheat yield map was generated from 876 field trials carried out from 1992 to 2018. The random forest model performed better than the model based only on soil. The updated national yield map was then compared to production potential maps from 1688 and 1844. While historical time periods are characterized by numerous low production potential areas and few highly productive areas, present-day production is evenly distributed between low and high production. Advances in technology and farm practices have exceeded historical yield predictions. Thus, modeling current yield could be unreliable in future years as technology progresses.